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A Drop to Drink
A Report on the Quality of Our Drinking Water

Environmental Protection Agency, Washington, D C

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A Drop to Drink

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A report on the quality of our drinking water

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An adult American consumes from one and a half to five or more quarts of water a day depending on climate, the kind of work performed, body size, and many other factors.

Most of us assume that the water we drink is safe. It usually is, but some people are using water that is improperly treated and may be contaminated by bacteria, toxic chemicals, metals, or other pollutants.

At least 4,000 known cases of waterborne illnesses occur each year in this country. The actual total may be ten times greater. Further, medical science has not yet determined the effects on people of long-term, low-level exposure to contaminated drinking water.

To combat this threat to our health, Congress enacted the Safe Drinking Water Act, which was signed by the President on December 16, 1974. The Act marks the first time a truly national commitment has been made to safeguard public drinking water supplies. It provides that the Federal Government—the U.S. Environmental Protection Agency (EPA)—set national standards for drinking water, and that the States enforce those standards and otherwise supervise public water supply systems.

This booklet describes the state of the Nation's drinking water and explains how the Act will help to protect your drinking water supplies.

Is Your Drinking Water Safe?

When EPA was created on December 2, 1970, it was given the responsibility for enforcing Federal drinking water standards. In recent years widespread evidence has been found of problems in drinking water supplies across the Nation. Here are some examples:

- In the period 1961-1973, there were more than 200 known or reported outbreaks of disease or poisoning caused by contaminated drinking water. Twenty-two people died and an estimated 54,537 became ill, many seriously. Some EPA water supply experts believe that perhaps ten times as many such outbreaks occur but go unreported for a variety of reasons, and that countless individual sufferers —and their doctors—fail to associate ailments with contaminated water. Germ-laden drinking water can cause salmonellosis and gastroenteritis, both serious illnesses involving the stomach and intestines, as well as typhoid and cholera.

- Based on a 1969 Community Water Supply Study, an estimated eight million people were being served potentially dangerous water from perhaps 5,000 community water supply systems.

Principal findings of the study, which actually evaluated 969 community water supply systems, were:

56 percent of the systems showed problems in equipment design, construction, or condition of the basic water treatment plants;

77 percent of the plant operators were not trained well enough in water microbiology, and 46 percent lacked proper knowledge of the chemistry related to their jobs;

79 percent of the systems had not been inspected by State or county authorities in the year before the study began;

Overall, small systems were found to have more problems than larger ones. These findings were supported by later U.S. Government studies.

- Studies begun in 1970 of public water supply systems in 13 States showed that many systems did not meet bacteria standards one or more months during the 12-month period before the studies were made.

Numerous systems also did not meet bacteria surveillance standards and others needed either additional treatment facilities or important changes in their operation. The studies for all 13 States recommended major increases in budgets of the State water supply supervisory agencies to protect public health.

- In 1975 a survey by EPA of public water supplies in 80 cities found that small quantities of organic chemicals were present in the systems in all parts of the country. Although the survey found them in very low concentrations in the water, their presence was cause for concern.

In addition to these studies, scientists warn that new contaminants are degrading drinking water. The use of chemical compounds in industry, homes, and on farms has increased sharply in the last several decades. There are thousands of toxic chemical compounds in use today. New chemicals are developed each year and many of these can enter and contaminate both surface and underground water. In large amounts some of the chemicals found in drinking water could cause cancer, genetic mutations, or birth deformities.

Chemical contaminants, such as phosphates (from fertilizers), nitrates, pesticides, detergents, metals, cyanide, phenols, radioactive substances, solvents, and some types of hydrocarbons, are all products of our advanced industrial society and are potential threats to our water sources.

Most conventional treatment plants, originally built to produce water from less-polluted sources, may not be effective in the removal of increasing amounts and varieties of these chemical contaminants, trace metals and radioactive materials.

EPA water supply investigators also are concerned about viruses in drinking water, because of deficiencies in the operation of water supply treatment facilities and distribution systems. Infectious hepatitis, for example, an illness of the liver, is caused by a virus that may find its way into water supplies.

A General Review of the Situation

There are more than 50,000 community water supply systems in this country and more than 200,000 water supply systems serving locations such as restaurants and motels. Many of them were not designed to cope with their present raw water quality. These systems were designed, primarily, to remove from the relatively clean water of earlier days the type of bacteria found in animals and people. The principal concerns at that time were typhoid, cholera, and dysentery. The risk of contracting the first two of these diseases now has been greatly reduced in the United States, thanks to better protection and management of our drinking water supplies. In the year 1900, for example, there were 35,379 deaths reported from typhoid fever. By comparison, in 1975 there were approximately 375 cases of typhoid reported, and of course this was in a U.S. population nearly three times that of the year 1900. In fact, the improvement of public water supplies has been the largest single factor in the dramatic decline of typhoid.

Federal standards for drinking water were first issued in 1914 to prevent the interstate spread of communicable diseases, and were modified and expanded several times thereafter. In 1962, the U.S. Public Health Service revised its drinking water standards. The standards set mandatory limits for health-related chemical and biological impurities, and recommended limits for impurities affecting appearance, taste and odor. Although these standards applied only to water supply systems serving interstate carriers such as trains, planes and buses, most States and large cities used them as guidelines to regulate drinking water quality within their jurisdictions.

When EPA was established in December 1970, it assumed responsibility for setting and enforcing Federal drinking water regulations, and continued a revision—already in progress—of the 1962 U.S. Public Health Service standards. This revision served as the basis for the interim primary regulations developed under the 1974 Safe Drinking Water Act.

The New Legislation

The 1974 Act was designed to assure that water supply systems serving the public meet minimum national standards for protection of public health.

The Act gives EPA responsibility for setting minimum national drinking water regulations for all public water systems throughout the United States having at least 15 service connections or regularly serving at least 25 people. The States are to play the lead role in enforcing these regulations. If a State is negligent in administering the law, however, EPA may take action. The Agency also may act to prevent or halt drinking water contamination posing an "imminent and substantial" health hazard if State and local authorities fail to respond.

If public water systems cannot reasonably meet the regulations, provision is made for States to grant variances and exemptions but these must not pose unreasonable risk to public health and a schedule must be established for compliance. A public hearing must be held before any public water system is granted such a schedule.

The drinking water regulations in the Act are of two types: primary and secondary. *Primary* regulations are aimed at protecting public health, taking cost into consideration. The 1975 regulations establish maximum allowable contaminant levels in drinking water. Future regulations may include water treatment techniques and general criteria for water supply system operation, maintenance, siting, and intake water quality. *Secondary* regulations are designed to protect public welfare, and deal with taste, odor, and appearance of drinking water.

On December 24, 1975, interim primary regulations were published by EPA, as required by the Act, to help safeguard the Nation's public drinking water supplies. The regulations, effective June 24, 1977, apply to about 250,000 public water systems. In brief, the interim regulations set maximum contaminant levels permitted for bacteria, maximum turbidity of water, and levels permitted for a number of organic and inorganic chemicals. They also set the minimum number of times drinking water systems must be sampled for adherence to the regulations.

In the meantime, the National Academy of Sciences is conducting a study on the health effects of drinking water contaminants. The report will form the basis of *revised* primary regulations—scheduled to be proposed in 1977 and to become effective in 1979.

If a public water supply system fails to comply with the primary regulations, or fails to meet a compliance schedule established under a variance or exemption granted by a State, it must give notice of this failure to its customers and the news media.

The Act also provides for regulating the underground injection of fluid to prevent the endangerment of underground sources of drinking water. This is accomplished by means of a regulatory program similar to that governing public water systems. Primary responsibility falls to the States where underground source protection programs have been established. If a State has failed to assume this responsibility within two years after enactment, EPA will prescribe a control program for that State.

The Act specifies that regulations will not be established that will interfere with oil or natural gas production, unless such regulations

are considered essential to ensure that underground drinking water sources will not be endangered by such injection.

Other highlights of the Act:

- EPA is authorized to conduct research on technological and health aspects of providing drinking water. Special studies required by Congress include a rural water survey, and research into the contamination of drinking water by waste disposal, viruses, and cancer-causing chemicals. Work in these and other research areas is underway.
- EPA is also authorized to help States improve their drinking water programs by providing technical assistance, employee training, and financial support.
- Provision is made for assuring adequate supplies of treatment chemicals for public water supply systems.
- A citizen may bring civil action against any public water system or Federal agency (including EPA) that he or she believes is violating the Act.
- A 15-member National Drinking Water Advisory Council is established to advise EPA on proper implementation of the legislation. The general public, State, and local agencies, and interested private organizations are represented on the Council.
- The Department of Health, Education, and Welfare, which oversees the safety of bottled drinking water, is required to make such water conform to the primary standards set under the Act, or publish reasons for not doing so.
- To help EPA implement the legislation, Congress authorized $156 million for each of the fiscal years 1975, 1976 and 1977.

Water supply research is essential to provide the scientific information necessary to support all levels of government in working for safe and esthetically acceptable drinking-water.

EPA research, for example, is developing techniques to make possible monitoring for viruses in drinking water. The association of viruses with hepatitis and other diseases is well known, but analytical methods for viruses have been difficult and expensive.

EPA is investigating the degree to which minimum chlorination and other types of disinfection of drinking water eliminate viruses along with bacteria. Viruses are not removed from water supplies unless treatment systems are operating properly. Much more research is needed on this potentially critical problem. Work also is required to develop effective methods to protect our water sources from new toxic chemicals and from radioactive wastes.

In addition, recent national surveys have demonstrated the widespread occurrence of chloroform and related compounds in the drinking water of utilities practicing chlorination. Chloroform has been shown to cause cancer in rats and mice under certain conditions. Research efforts have demonstrated that chloroform production can be greatly reduced by avoiding chlorination prior to clarification, or by removing certain organic chemicals by filtration through granular activated carbon. This type of carbon also is effective for removing many other undesirable organics from water.

EPA's water supply research is primarily directed to:

- Investigations of waterborne diseases to determine relationships between drinking water quality and disease in communities. This research includes

determination of the acute and long-range chronic effects on people of organic and inorganic chemicals that may be found in drinking water. Many of the thousands of different toxic chemicals in industrial use today find their way into water sources. The studies seek to determine safe tolerance limits of these chemicals in drinking water.

- Development of simple, rapid methods for detection and measurement of bacteria, chemicals, and toxic agents in water.
- Development of improved water treatment processes.

The Safe Drinking Water Act will provide much of the funds necessary to maintain EPA's initiative in drinking water supply research.

The quality of source waters, generally, will determine the treatment processes required to produce safe, acceptable drinking water.

Most surface waters are subject to temporary deterioration in quality through increased levels of turbidity, algae growths, and various contaminants. To be on the safe side, surface waters should receive more than simple disinfection. Treatment could include collecting solids, allowing them to settle out, filtering the water, or a combination of these methods.

If waters are too contaminated for treatment by such processes, they will require non-conventional and perhaps newly developed methods. In addition, great care should be taken to prevent and control contamination of the raw-water source.

Disinfection is the minimum recommended treatment for groundwater used in public water supply systems. Over the years, drinking water from protected wells has been delivered to customers without any treatment. However, contamination of such distribution systems together with related outbreaks of disease have demonstrated the need for adding a disinfectant such as chlorine when necessary.

Individual homes use ground water from springs and wells; these serve some 30 million Americans. In addition, about 80 million people are served by community systems that draw upon groundwater. Water from deep wells is often acceptable but problems due to geology can arise. Infectious hepatitis and typhoid fever from contaminated shallow wells have been reported in some areas. Such pollution may be caused by seepage from septic tanks or contaminated surface waters.

What About the Future?

The Federal Water Pollution Control Act of 1972 proclaims two general goals for the United States:

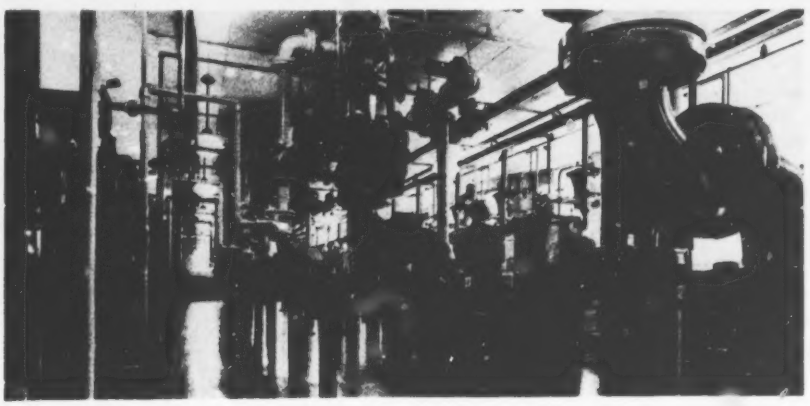
- Wherever possible by July 1, 1983, water that is clean enough for swimming and other recreational use, and clean enough for the protection and propagation of fish, shellfish, and wildlife.
- And then, by 1985, no more discharges whatsoever of pollutants into the Nation's waters.

Obviously, the improvement of surface waters under the 1972 Act will make it easier to provide safe drinking water, since discharges into streams and lakes ultimately affect sources of public water systems. However, surface water will still require treatment before it is used in water supply systems. Sediments must be removed and the water filtered, taste and odor controlled, and disinfectant added because of the possibility of human error and the introduction of contaminants. The water supply treatment plant is the last barrier between the consumer and impure water.

An estimated 50 percent of the Nation is served by drinking water from surface sources, some of which receive industrial waste, untreated sewage, urban runoff, and effluent from sewage treatment plants. Health officials have relied on storage and treatment of this water to protect the public against infectious diseases and toxic substances.

Safeguards must be provided to prevent the introduction of untreated or inadequately treated wastes into drinking water systems. One such safeguard would involve some system of stream storage or holding and dilution reservoirs between the reclamation plant and the drinking water intake. Biological and chemical monitoring of stored waters is essential.

Removal of salt from water could provide many areas of the country with new drinking water sources. Such desalination is now employed in many parts of the world. However, it is expensive because of related fuel and construction costs. It is used in certain areas, including parts of Florida, Oklahoma, Arizona, California and in the American Virgin Islands, where shipping or piping in fresh water would be even more costly.



An Informed Citizenry

Citizen awareness and participation is an important part of the national effort in maintaining pure drinking water. There are several ways in which you can take part in the public process.

First, you should familiarize yourself with the Safe Drinking Water Act, and EPA, State, and local regulations governing drinking water. Then find out how your water measures up, including the adequacy of future supplies, treatment and testing procedures, standards of purity, and current research.

Examine testing records. Is your supplier testing as frequently as regulations require? Is the water tested for all contaminants cited in the regulations?

If you are dependent upon individual water supplies, has your well or cistern been inspected and have samples from these sources been tested by your local or county health department?

If your drinking water has an unpleasant taste, odor, or appearance, contact the water utility for an explanation. If the answer is not satisfactory, call or write your State health or environmental protection department, since these agencies deal with "aesthetic" factors in drinking water.

However, if you suspect the water is actually unsafe, you should immediately call the same authorities—the water utilities and State agency overseeing water systems—and demand an explanation. If the answers are unacceptable, contact your nearest EPA office.

The Safe Drinking Water Act of 1974 requires every public water system to notify customers of any failure of the system to comply with requirements of the primary drinking water regulations. This includes any instance when the system receives a variance or exemption from requirements. Such notification usually must be given every three months in newspapers of general circulation, and must be included in customers' water bills.

If you believe adequate measures are not being taken to correct problems in your drinking water supply system, you have the right under the law to petition EPA to hold hearings aimed at bringing the utility into compliance. You also have the right to bring suit against anyone you believe is violating the Act.

It is therefore important for you to know your local water supplier, understand the law, and keep aware of notices in your water bills and local newspapers by your water utility.

An informed citizenry, willing to exert a full measure of power, can demand and get safe water supplies. A willingness to pay the associated costs also is important. The widespread menace of typhoid and cholera was virtually wiped out earlier in this century because the public was ready and willing to shoulder the costs of proper water systems. That same attitude is even more important today in light of the discoveries scientists have made about the need for up-to-date measures to protect our drinking water.